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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
WHELPLEY, MICHAEL V	
ART UNIT	**PAPER NUMBER**
2671	9

DATE MAILED: 04/05/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/964,765	DOYLE ET AL.	
	Examiner	Art Unit	
	Michael V Whelpley	2671	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12 December 2003*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *31-53* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *31-53* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *14 November 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

Specification

1. The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not).

Misnumbered claims 37-54 been renumbered 36-53, respectively. Also, the dependency of claims has been renumbered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claims 44 and 49 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claim 44 recites the limitation "the depth interpolator" in line 2. There is insufficient antecedent basis for this limitation in the claim. It appears that this claim should be dependent on Claim 43 (i.e. renumbered Claim 44).

6. Claim 49 recites the limitation "a ration" in line 3. There is insufficient antecedent basis for this limitation in the claim. It appears that the word "ration" should instead be "ratio".

Claim Rejections - 35 USC § 102

7. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

The changes made to 35 U.S.C. 102(e) by the American Inventors Protection Act of 1999 (AIPA) and the Intellectual Property and High Technology Technical Amendments Act of 2002 do not apply when the reference is a U.S. patent resulting directly or indirectly from an international application filed before November 29, 2000. Therefore, the prior art date of the reference is determined under 35 U.S.C. 102(e) prior to the amendment by the AIPA (pre-AIPA 35 U.S.C. 102(e)).

8. Claims 31-53 are rejected under 35 U.S.C. 102(e) as being anticipated by Lapidous, et al. (US Patent 6,677,645). Lapidous describes a graphics system that includes a multi-resolution depth buffer for eliminating hidden surfaces in 3D graphics.

9. With regard to Claim 31, Lapidous describes depth buffer in which a depth value is computed for a given pixel, and compared against a stored W-buffer value from the depth buffer to check for visibility (Col 9 Line 61 – Col 10 Line 8). The values are stored in a floating-point format (Col 4 Lines 36-43), which is a variable format. The view volume is transformed to a normalized cube (Col 7 Lines 32-43), which normalizes the values of pixels in the view volume.

10. With regard to Claim 32, Lapidous describes a depth value calculation module 1010 (Fig 10) that computes the depth values of each pixel (Col 14 Lines 28-29).

11. With regard to Claim 33, Lapidous describes a decision logic module 1050 and a depth storage module 1070 (Fig 10) that receive depth values from the depth calculation module 1010 and write depth values to the buffer in the format (as determined by decision logic module 1050) of the buffer used (Col 14 Lines 45-49).

12. With regard to Claim 34, the rationale for Claim 33 is incorporated. In addition, Lapidous describes a decision logic module 1050 (Fig 10) that identifies the format of the depth buffer to be used in a depth test (Col 14 Lines 34-40). The format of the buffer is either a 24-bit value, with 20 mantissa bits (i.e. fraction bits) and 4 exponent bits, or a 16-bit value, with 12 mantissa bits and 4 exponent bits (Col 10 Lines 58-68).

13. With regard to Claim 35, the rationale for Claim 33 is incorporated. In addition, the decision logic module and depth storage module read the values stored in the buffer and provide them to the visibility testing module 1040. The decision logic module 1050 determines which format will be read from the buffer (Col 14 Lines 34-45).

14. With regard to Claim 36, Lapidous describes an embodiment of the invention in which the size of the depth buffer used to test the depth of a pixel is dependent on the comparison of the depth value with a pre-determined threshold. The view volume is transformed to a normalized cube (Col 7 Lines 32-43), which normalizes the values of pixels in the view volume. For each pixel in a primitive, the depth value is computed and converted to the storage format of the buffer, which may be a W-buffer (Col 13 Lines 25-46). The values are stored in a floating-point format (Col 4 Lines 36-43).

15. With regard to Claim 37, Figure 9A shows the process of visibility testing, in which a stored buffer value representing the depth of a pixel is read (920, 925) and compared against the depth value of another pixel (930, 935).

16. With regard to Claim 38, Lapidous describes a display unit 1090 (Fig 10) that displays visible pixels (Col 14 Lines 51-54).

17. With regard to Claim 39 and 40, the number of bits of the floating point format used in the buffer is determined by a comparison of a the depth value of a pixel in an image with a predetermined threshold (Col 13 Lines 27-43).

18. With regard to Claim 41, Lapidous describes the format of the buffer as a floating point number with either a 24-bit value, with 20 mantissa bits (i.e. fraction bits) and 4 exponent bits, or a 16-bit value, with 12 mantissa bits and 4 exponent bits (Col 10 Lines 58-68). The format of the buffer used is dependent on whether the depth of the pixel being tested is greater or lesser than a threshold value. The threshold value may be determined by the equations (Zv–Zn)/(Zf-Zn)=0.5, Zf/Zn=1000, wherein Zv is the threshold distance from the camera, and Zn and Zf are the near and far planes of the view volume, respectively (Col 9 Line 61 – Col 10 Line 8). The resulting image includes everything within the volume defined by its near and far planes; therefore, the near and far planes of the view volume are equivalent to the near and far plane of the image.

19. With regard to Claim 42, the rationale for Claim 31 is incorporated. Lapidous also describes a display unit 1090 (Fig 10) that displays visible pixels (Col 14 Lines 51-54).

20. With regard to Claim 43, the rationale for Claim 32 is incorporated.

21. With regard to Claim 44, the rationale for Claim 33 is incorporated.

22. With regard to Claim 45, the rationale for Claim 34 is incorporated.

23. With regard to Claim 46, the rationale for Claim 35 is incorporated.

24. With regard to Claims 47-49, the rationale for Claim 41 is incorporated. The floating point format of the W buffer is a variable format. In addition, Lapidous describes a decision logic module 1050 (Fig 10) that identifies the format of the depth buffer to be used in a depth test (Col 14 Lines 34-40). The format of the buffer is either a 24-bit value, with 20 mantissa bits (i.e. fraction bits) and 4 exponent bits, or a 16-bit value, with 12 mantissa bits and 4 exponent bits (Col 10 Lines 58-68).

25. With regard to Claim 50, Lapidous describes an embodiment of the invention wherein, if the depths of the pixels of an image (which may be a first image) are greater than a predetermined threshold, a 16-bit W buffer is used to store the depth values of the pixels (Col 9 Line 61 – Col 10 Line 4). The view volume is transformed to a normalized cube (Col 7 Lines 32-43), which normalizes the values of pixels in the view volume. The values are stored in a floating-point format (Col 4 Lines 36-43). Figure 10 illustrates a diagram of a graphics subsystem in a computer system that is designed in accordance with the invention; this subsystem may be embodied within a machine-readable medium containing instructions for a computer system.

26. With regard to Claim 51, if the depths of the pixels of another image (which may be a second image) are greater than a predetermined threshold, a 24-bit W buffer is used to store the depth values of the pixels (Col 10 Lines 4-8).

27. With regard to Claim 52, the format of the buffer is a floating point number with either a 24-bit value (for the second image), with 20 mantissa bits (i.e. fraction bits) and 4 exponent bits, or a 16-bit value (for the first image), with 12 mantissa bits and 4 exponent bits (Col 10 Lines 58-68).

28. With regard to Claim 53, the rationale for Claim 41 is incorporated. If the first near and far depth values associated with the first near and planes of the first image are equivalent to Zn and Zv (respectively), the equations for the threshold determining the format of the buffers [(Zv–Zn)/(Zf-Zn)=0.5, Zf/Zn=1000] have a ratio incorporating Zn and Zv. Likewise, if the second near and far depth values associated with the first near and planes of the second image are equivalent to Zv and Zf (respectively), the equations for the threshold determining the format of the buffers have a ratio incorporating Zv and Zf.

Response to Arguments

29. Applicant's arguments with respect to claims 31-53 have been considered but are moot in view of the new grounds of rejection. The newly added limitations are taught by the new reference.

Conclusion

30. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael V Whelpley whose telephone number is (703) 305-5584. The examiner can normally be reached on 8:30-5, M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mark Zimmerman can be reached on (703) 305-3900. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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